ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Monday, August 03, 2009 7:34 PM
To: 'usepr@areva.com'
Cc: Reichelt, Eric; Miernicki, Michael; Patel, Jay; Terao, David; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: Draft - U.S. EPR Design Certification Application RAI No. 265 (3358), FSAR Ch. 3
Attachments: Draft RAI_265_CIB1_3358.doc

Attached please find draft RAI No. 265 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 710

Mail Envelope Properties (C56E360E9D804F4B95BC673F886381E71FBDCDDB8F)

Subject: Draft - U.S. EPR Design Certification Application RAI No. 265 (3358), FSAR Ch. 3
Sent Date: 8/3/2009 7:34:03 PM
Received Date: 8/3/2009 7:34:04 PM
From: Tesfaye, Getachew

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Files	**Size**	**Date & Time**
MESSAGE	721	8/3/2009 7:34:04 PM
Draft RAI_265_CIB1_3358.doc	39418	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Draft

Request for Additional Information No. 3358 Revision 0

8/3/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.06.03 - Leak-Before-Break Evaluation Procedures
Application Section: 03.06.03

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

03.06.03-20

Follow-up to RAI Question 03.06.03-3

During the 6/09/2009, audit, the staff reviewed information related to Dynamic Strain Aging (DSA) and recommendations regarding metallurgical and heat treatment specifications as well as improvements to production welding procedures for ferritic base metals that would minimize the concern for dynamic strain aging. AREVA is requested to formally submit this material so the staff can review the recommendations and AREVA's approach.

03.06.03-21

Follow-up to RAI Question 03.06.03-6

RAI Question 03.06.03-6 requested AREVA to provide the material toughness (J-R curves) values for each of the materials used in the analyses as well as material constants. AREVA responded that the J-R curves for the MSL were reviewed by the staff during the June 26, 2008 audit. It was also stated that for stainless steel material, the material constant was reduced by 30% to account for heat to heat variations and thermal aging. Please provide the J-R curves and the basis for the 30% reduction of J-R toughness curves.

03.06.03-22

Follow-up to RAI Question 03.06.03-10

In RAI 03.06.03-10 AREVA was requested to justify the use of the crack morphology parameters used in the leakage calculations. During the 06/09/2009 audit, AREVA provided a comparison of the data between KRACKFLO(AREVA) and SQUIRT(NRC) sorfware. AREVA stated in order to get similar results with SQUIRT, they use a penalty factor of 26 in KRACKFLO (and an improved crack morphology option with SQUIRT). Please provide the basis for using these criteria. Additionally, the following factors need to be accounted for by AREVA that could affect the ALL diagram:

a. Compare crack length for the leakage limits between KRACKFLO and SQUIRT with and without the improved COD-dependant crack morphology.

b. Examine and validate the effect of tensile stress-strain curve on crack-driving force J-applied to assess, leak versus moment curves as well as J applied for flaw stability analysis.

c. Effect of J-R material property data being too low. While using a low J-R curve is conservative, the values to fit the J-R curve seemed to result in an unusually low curve and may need to be confirmed.

d. As was discussed in the audit of June 9, 2009, air fatigue morphology is the least conservative assumption for leak-rate calculations. If an SCC or corrosion morphology is assumed in the calculations (as a lower bound conservative case) each of the ALL diagrams will change. AREVA is requested to provide justification for using air fatigue or provide an analysis using a corrosion fatigue and SCC for comparison.

03.06.03-23

Follow-up to RAI Question 03.06.03-13

In response to RAI 03.06.03-13, AREVA referenced EPRI Report 1009801, "Materials Reliability Program (MRP), Resistance to Primary Water Stress Corrosion Cracking of Alloys 690, 152, 52 in Pressurized Water Reactors (MRP-111), Electric Power Research Institute, March 2004, which contained controls for welding dilution effects and chromium content. Please provide the data contained in the EPRI Report for review and clarification of dilution effects and chromium content in nickel based welds.

03.06.03-24

Follow-up to RAI Question 03.06.03-14

In response to RAI 03.06.03-14, AREVA stated that a safety factor of 1.7 is the highest attainable safety factor that can be used to qualify the MSL piping for LBB for the U.S. EPR design. AREVA is requested to check the Ramberg-Osgood fit of the stress-strain data for the MSL to verify that the J driving force is modeled correctly, and then again address the safety factor of 1.7.

03.06.03-25

During the NRC/AREVA audit on 06/09/2009, there was much discussion between AREVA and the NRC staff concerning the comparison data between KRACKFLO(AREVA) and SQUIRT(NRC). AREVA stated that in order to get similar results with SQUIRT, it uses a "penalty factor" of 26 for KRACKFLO and an improved crack morphology option for SQUIRT. AREVA is requested to provide the basis for their penalty factor of 26 in KRACKFLO to compare their results to SQUIRT results using the improved crack morphology option. Please identify what variable/variables are modified by the penalty factor in their leak rate analysis.

03.06.03-26

During the audit on 06/09/2009 between the NRC and AREVA, AREVA stated that the material properties of ASME SA-106 was being used to obtain the moment vs. crack length curves for the surge line in the EPR design. However, the material that is to be used for construction is identified as ASME SA-508. In the staff's confirmatory analysis, the stress-strain curves for ASME SA-508 were higher, which would result in a greater amount of constraint of the plasticity. This was confirmed by the staff's Finite Element analysis. AREVA is requested to:

a. Verify that ASME SA-508 is the material to be used in construction for the nozzles and specify which grade or class of SA-508.

b. Provide a confirmatory analysis on ASME SA-508 and justify that ASME SA-106 is more conservative.

c. Perform a Finite Element analysis between the two materials much like what the staff has performed and discussed during the 06/09/2009 audit.